

WHAT IS CLAIMED IS:

1. A method of manufacturing a semiconductor device, comprising the steps of:
forming a conductive film over a gate insulating film;
forming a first hard mask over the conductive film;
5 doping a semiconductor film with an impurity at a high concentration while
masking the conductive film with the first hard mask;
forming a second hard mask by making the first hard mask shrink through
etching after the high concentration impurity doping;
doping the semiconductor film with an impurity at a low concentration while
10 masking the conductive film with the second hard mask; and
forming a gate electrode by processing the conductive film while masking the
conductive film with the second hard mask after the low concentration impurity doping.

2. A method of manufacturing a semiconductor device, comprising the steps of:
15 forming a conductive film over a gate insulating film;
forming a first hard mask over the conductive film;
doping a semiconductor film with an impurity at a high concentration while
masking the semiconductor film with the first hard mask;
forming a second hard mask by making the first hard mask shrink through
20 etching after the high concentration impurity doping;
forming a gate electrode by processing the conductive film while masking the
conductive film with the second hard mask; and
doping the semiconductor film with an impurity at a low concentration while
masking the semiconductor film with the second hard mask after forming the gate
25 electrode.

3. A semiconductor device, comprising a gate electrode formed over a gate insulating film and a hard mask formed over the gate electrode.

5 4. A semiconductor device, comprising:
a gate electrode formed over a gate insulating film;
a hard mask formed over the gate electrode,
a conductive film which is to serve as a wire for sending a signal to the gate electrode or as a connection layer for connecting the wire with the gate electrode and is in contact with the gate electrode.

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5. A method of manufacturing a semiconductor device, according to claim 1, wherein the conductive film is selected from the group consisting of tantalum nitride and tungsten.

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6. A method of manufacturing a semiconductor device, according to claim 1, wherein the hard mask is selected from the group consisting of silicon oxide.

20 7. A method of manufacturing a semiconductor device, according to claim 2, wherein the conductive film is selected from the group consisting of tantalum nitride and tungsten.

8. A method of manufacturing a semiconductor device, according to claim 2, wherein the hard mask is selected from the group consisting of silicon oxide.

25 9. A semiconductor device, according to claim 3, wherein the gate electrode is selected from the group consisting of tantalum nitride and tungsten.

10. A semiconductor device, according to claim 3, wherein the hard mask is selected from the group consisting of silicon oxide.

5 11. A semiconductor device, according to claim 4, wherein the gate electrode is selected from the group consisting of tantalum nitride and tungsten.

12. A semiconductor device, according to claim 4, wherein the hard mask is selected from the group consisting of silicon oxide.

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13. A semiconductor device, according to claim 4, wherein the conductive film is selected from the group consisting of tantalum nitride and tungsten.